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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/066,270	01/31/2002	Keith W. Holt	01-869	4428

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EXAMINER	
TORRES, JOSEPH D	
ART UNIT	PAPER NUMBER
2133	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	12/20/2006	PAPER.

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/066,270	HOLT, KEITH W.	
	Examiner	Art Unit	
	Joseph D. Torres	2133	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED. (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 November 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-8,10,11,13,23 and 25-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-8,10,11,13,23 and 25-28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *24 September 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims 1, 3-8, 10, 11, 13, 23 and 25-28 have been considered but are moot in view of the new ground(s) of rejection.

Information Disclosure Statement

2. Applicant and the assignee of this application are required under 37 CFR 1.105 to provide the following information that the examiner has determined is reasonably necessary to the examination of this application.

In response to this requirement, please provide answers to each of the following interrogatories eliciting factual information:

The Examiner requests that the Applicant provide an explanation of what is meant by "the cyclic redundancy check metadata is the only metadata managed" providing precise locations in the Applicant's specification supporting the explanation (Note: pointing to a location in the specification where the language is recited does not satisfy this requirement because, in the places such as Paragraph [0019] where similar language is recited, the Applicant provides no explanation for the expression "the cyclic redundancy check metadata is the only metadata managed"; Note the actual expression "the cyclic redundancy check metadata is the only metadata managed" is not used anywhere in the Applicant's specification).

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 1, 3-8, 10, 11, 13, 23 and 25-28 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claims 1 and 23 substantially recite, "wherein the cyclic redundancy check is generated and managed at a sector level and **the cyclic redundancy check metadata is the only metadata managed**" [Emphasis Added].

Paragraph [0019] in the Applicant's specification only recites, "CRC information is the only metadata that must be managed" and in fact paragraph [0017] in the Applicant's specification recites, "The disk array controller uses CRC metadata to make an initial determination as to whether data read from a disk drive is valid"; hence the Applicant also teaches that data is managed along with CRC. Furthermore; nowhere has the Applicant shown how validity of data can be checked without accessing data (Note: the Applicant instead teaches that data is accessed to regenerate CRC to compare with the metadata CRC).

The Examiner assumes the Applicant means that metadata CRC can be independently controlled.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 1, 3-8, 10, 13, 23 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Idleman; Thomas E. et al. (US 5274645 A, hereafter referred to as Idleman) in view of Weng; Lih-Jyh (US 5265104 A) in further view of Krueger; Mark S. et al. (US 5331646 A, hereafter referred to as Krueger).

35 U.S.C. 103(a) rejection of claims 1 and 23.

Idleman teaches reading data from the data disk drive (col. 21, lines 51-68 in Idleman and col. 20, lines 11-14 in Idleman);

generating an parity code from the data read from the data disk drive (col. 21 lines 61-68 in Idleman teaches that during a parallel read operation, ACC 348 uses the

P and Q terms to determine if the data being received from the disk drives is correct; Note: one of ordinary skill in the art at the time the invention was made would have recognized that an such a check is a standard process whereby new P and Q terms are regenerated and compared to the read P and Q terms however, if the Applicant is aware of any other reasonable method of doing an error check, the Applicant is welcome to present the details on the method and on reasons why any one of ordinary skill would choose to use such a method when such a simple cost-effective recognized industry-prevalent and established method by regenerating P and Q terms already exists [col. 23, lines 45-47 allude to this process by affirming P and Q terms are only calculated when all data are read in parallel so that all the data necessary to calculate P and Q terms is present]); and

in parallel with the reading of the data from the data disk drive and the generating a parity code from the data read from the data disk drive, reading parity metadata (col. 21 lines 55-68 in Idleman teaches a parallel read operation comprises reading data, P and Q parity and using P and Q terms to determine if the data being received from the disk drives is correct; Note: one of ordinary skill in the art at the time the invention was made would have recognized that an such a check is a standard process whereby new P and Q terms are regenerated and compared to the read P and Q terms however, if the Applicant is aware of any other reasonable method of doing an error check, the Applicant is welcome to present the details on the method and on reasons why any one of ordinary skill would choose to use such a method when such a simple cost-effective recognized industry-prevalent and established method by regenerating P and Q terms

already exists [col. 23, lines 45-47 in Idleman allude to this process by affirming P and Q terms are only calculated when all data are read in parallel so that all the data necessary to calculate P and Q terms is present]);

comparing the generated error detection and correction code of the read data with the error detection and correction code stored as metadata (col. 23, lines 45-47 in Idleman);

determining data validity of data read from the data disk drive based on the comparison of error detection and correction code metadata and the generated error detection and correction code (col. 21 lines 55-68 in Idleman teaches a parallel read operation comprises reading data, P and Q parity and using P and Q terms to determine if the data being received from the disk drives is correct),

wherein the parity metadata is stored in a disk drive separate from the data read from the data disk drive (see P and Q drives in Figure 10 of Idleman). Note also that Idleman teaches the use of a Reed Solomon error correction and detection ECC code (col. 18, lines 23-29 in Idleman; Note: a systematic Reed-Solomon code is an error correction and detection CRC code) and the generation of the ECC code in the ACC 348 in Figure 10 of Idleman during a parallel read operation.

However Idleman does not explicitly teach the specific use of an error detection and correction code cyclic redundancy check that is stored in separate disk drives.

Weng, in an analogous art, teaches use of an error detection and correction code cyclic redundancy check that is stored in separate disk drives (the Abstract in Weng teaches using an (n,k) distance D Reed-Solomon code to generate, for each set of k symbols

stored on k data drives, n-k redundancy symbols, and recording the generated symbols in the corresponding storage locations on each of the n-k separate redundant drives; Note: a systematic Reed-Solomon code is a CRC code).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Idleman with the teachings of Weng by including use of an error detection and correction code cyclic redundancy check that is stored in separate disk drives. This modification would have been obvious to one of ordinary skill in the art, at the time the invention was made, because one of ordinary skill in the art would have recognized that use of an error detection and correction code cyclic redundancy check that is stored in separate disk drives would have provided a means for reducing the number of redundant drives required for implementing a robust drive system with immunity to errors (col. 2, lines 6-27 in Weng).

However Idleman and Weng does not explicitly teach the specific use of independent control of parity drives.

Krueger, in an analogous art, teaches use of independent control of parity drives (Figure 1 in Krueger teaches a separate HBA adapter independently accessing parity storage).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Idleman and Weng with the teachings of Krueger by including use of independent control of parity driv. This modification would have been obvious to one of ordinary skill in the art, at the time the invention was made, because one of ordinary skill in the art would have recognized that use of independent control of

parity driv would have provided recovery even for two drive failure maximizing drive utilization (col. 4, lines 32-35 in Krueger).

35 U.S.C. 103(a) rejection of claim 3.

Col. 21 lines 61-68 in Idleman teaches that during a parallel read operation, ACC 348 uses the P and Q terms to determine if the data being received from the disk drives is correct. Claim 25 in Idleman teaches comparing said check error detection term to said at least one error detection term to determine that said data has been not corrupted.

35 U.S.C. 103(a) rejection of claim 4.

Claim 26 in Idleman teaches correcting data if it is determined that said data has been corrupted.

35 U.S.C. 103(a) rejection of claim 5.

Col. 22, lines 44-55 in Idleman teaches regeneration of data. Note: data includes ECC and parity.

35 U.S.C. 103(a) rejection of claims 6-8.

Col. 21 lines 61-68 in Idleman teaches that during a parallel read operation, ACC 348 uses the P and Q terms to determine if the data being received from the disk drives is correct. Claim 25 in Idleman teaches comparing said check error detection term to said at least one error detection term to determine that said data has been not corrupted.

35 U.S.C. 103(a) rejection of claim 10.

Reed-Solomon and simple parity codes are block codes.

35 U.S.C. 103(a) rejection of claim 13.

See data drives 0-3 and parity drives P and Q in Idleman. The Abstract in Weng teaches redundant drives for storing Reed-Solomon ECC data.

35 U.S.C. 103(a) rejection of claim 25.

Col. 21 lines 61-68 in Idleman teaches that during a parallel read operation, ACC 348 uses the P and Q terms to determine if the data being received from the disk drives is correct. Claim 25 in Idleman teaches comparing said check error detection term to said at least one error detection term to determine that said data has been not corrupted.

5. Claims 11 and 26-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Idleman; Thomas E. et al. (US 5274645 A, hereafter referred to as Idleman), Weng; Lih-Jyh (US 5265104 A) and Krueger; Mark S. et al. (US 5331646 A, hereafter referred to as Krueger) in view of Iwatani; Sawao (US 6023780 A).

35 U.S.C. 103(a) rejection of claim 11.

Idleman, Weng and Krueger substantially teaches the claimed invention described in claims 1, 3-8 and 10 (as rejected above).

However Idleman, Weng and Krueger does not explicitly teach that the size of the error detection and correction code metadata is 4 bytes per 512 bytes of data read from the disk drives.

The Examiner asserts that Iwatani, in an analogous art, teaches n blocks of data are encoded to produce a single parity block. If n=128 then the size of the error detection and correction code parity metadata is 4 bytes per 512 bytes of data read from the disk drives, hence 4 parity bytes per 512 bytes of data is a specific embodiment of the teachings in the Iwatani patent. One of ordinary skill in the art at the time the invention was made would have been highly motivated to select a specific embodiment based on obvious Engineering Design choice requirements such as data rate and error rate requirements.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Idleman, Weng and Krueger patents with the teachings of the Iwatani patent by selecting the size of the error detection and correction code metadata to be 4 bytes per 512 bytes of data read from the disk drives. This modification would have been obvious to one of ordinary skill in the art, at the time the invention was made, because one of ordinary skill in the art would have recognized that selecting the size of the error detection and correction code metadata to be 4 bytes per 512 bytes of data read from the disk drives would have provided the opportunity to implement a specific embodiment of the teachings in the Iwatani patent based on obvious Engineering Design choice requirements such as data rate and error rate requirements.

35 U.S.C. 103(a) rejection of claim 26.

CRC Check S10 in Figure 6 of Iwatani teaches comparing the error detection and correction code stored as metadata RP in Read Operation 17-5 of Figure 5 of Iwatani with the new reconstructed host CRC check data error detection and correction code (see col. 19, lines 55-61 in Iwatani).

35 U.S.C. 103(a) rejection of claims 27 and 28.

Step S11 in Figure 6 of Iwatani teaches that if the error detection and correction code stored as metadata RP in Read Operation 17-5 of Figure 5 of Iwatani matches the new reconstructed host CRC check data error detection and correction code, then accepting the reconstructed data as valid data (see col. 19, lines 55-61 in Iwatani).

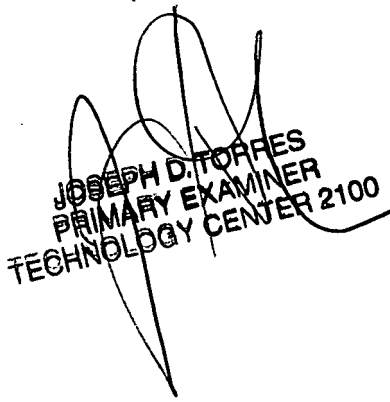
Step S10 in Figure 6 of Iwatani teaches that if the error detection and correction code stored as metadata RP in Read Operation 17-5 of Figure 5 of Iwatani does not match the new reconstructed host CRC check data error detection and correction code, then accepting the data read from the data drive as valid data (see col. 19, lines 55-61 in Iwatani; Note: the reconstructed data that is finally accepted after various iterations is data reconstructed from data read from the hard drive: Note also that in the second iteration, if the CRC is corrupted, then the reconstructed data is identically data read from the data drive).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joseph D. Torres whose telephone number is (571) 272-3829. The examiner can normally be reached on M-F 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Albert Decady can be reached on (571) 272-3819. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Joseph D. Torres, PhD
Primary Examiner
Art Unit 2133